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AN UPPER MIOCENE SUID FROM THE GOBI DESERT[1]

By Edwin H. Colbert

Among the fossils collected by the Central Asiatic Expedition, are two palatal fragments of the genus *Listriodon*, which were found by the field party of 1930 in the Tung Gur beds, at a locality known as Wolf Camp in the Eastern Gobi, Inner Mongolia. As a corollary to some studies on *Listriodon* from the Siwalik beds of India, it has been thought well to bring out a special description of these Mongolian specimens, not only in view of the fact that they represent a new species of the genus, but also because they constitute a record of *Listriodon* from a portion of Asia where hitherto it had been unknown. The illustrations for this paper were made by Louise Germann.

Listriodon mongoliensis, new species

Type.—Amer. Mus. No. 26504. A palate with right and left P^3-M^3.

Paratype.—Amer. Mus. No. 26517. A right maxilla, with P^2-M^1.

Horizon and Locality.—From the Tung Gur (or *Platybelodon*) beds of Upper Miocene age. Both specimens were found in the Wolf Camp quarry, forty miles southeast of Iren Dabasu, Inner Mongolia.

Diagnosis.—A very large *Listriodon*, comparable to *Listriodon splendens* in size. As in other members of this genus, the palate is very broad, and the enamel of the cheek teeth is rugose. *Listriodon mongoliensis* is characterized by the relatively narrow second premolar, and by the separate outer cusps of the fourth premolar. The molars are quite similar to those of *Listriodon splendens*.

Listriodon mongoliensis is very close to *Listriodon splendens* of the European Miocene, and to *Listriodon pentapotamiae* from the Lower Siwalik beds of India. Indeed, the correspondences between the molar teeth of these three species are so striking that we must needs look to the premolars in order to find differences that will help to distinguish the Mongolian form.

The second and third premolars of *Listriodon mongoliensis* are triangular in outline, each with one apex directed anteriorly. Thus the front portion of each tooth is very narrow, while the back portion is rather wide. Each tooth consists of a central cusp, from which an external ridge runs back to the posterior border. There is a low postero-internal cusp that is clearly an upgrowth of an expanded cingulum, and on the utmost postero-internal corner of the third premolar there is a

[1]Publications of the Asiatic Expeditions of The American Museum of Natural History. Contribution No. 120.

cingular loop, which when moderately worn, would form a small fossette. A slight anterior cingulum is present in both teeth. The second premolar is distinguished from the same tooth in *Listriodon splendens* or *Listriodon pentapotamiae* by its relative narrowness.

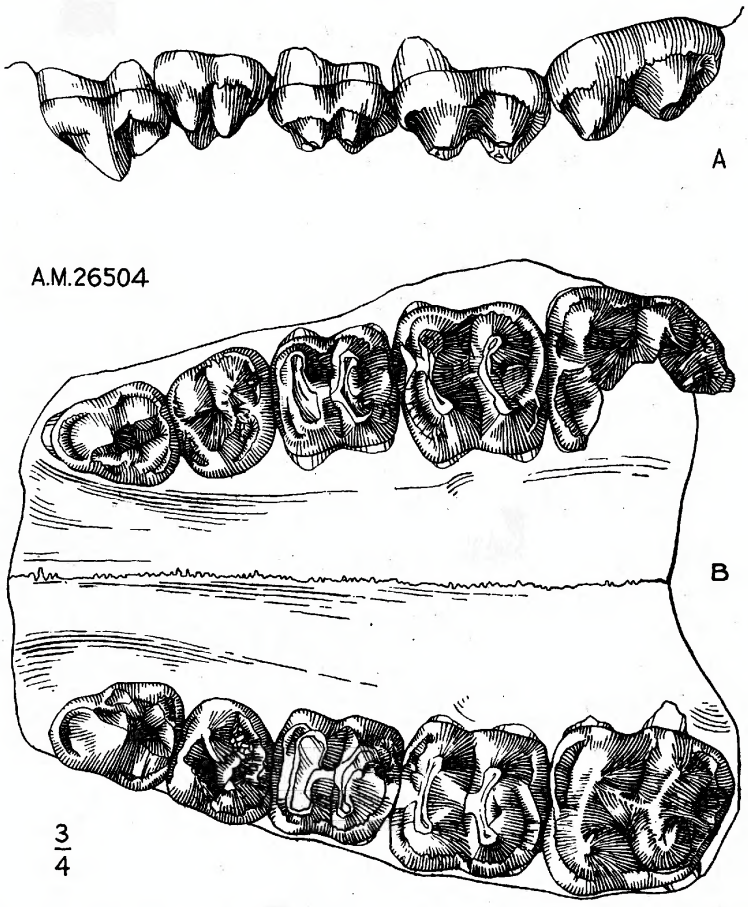

Fig. 1. *Listriodon mongoliensis*, new species. Type, Amer. Mus. No. 26504. Palate with P^3-M^3 on both sides. A, lateral view of left cheek teeth, with inner portion of M^3 restored. B, crown view. Three-fourths natural size.

The fourth premolar consists of two outer cusps and an inner one, with antero- and postero-internal cingula. This tooth is almost quadrate in its outline, and its breadth considerably exceeds its length. As noted above, in the diagnosis of the species, the fourth premolar in *Listriodon mongoliensis* is characterized by the separateness of the two

outer cusps, which are divided by a cleft almost to the base of the crown, a feature that distinguishes this species from the other lophodont listriodonts. The form of this fourth premolar clearly shows an advance towards the molariform condition, for a transverse ridge connects the inner and the anterior outer cusp. One need only imagine the upgrowth of a second inner cusp from the already expanded postero-internal angle of the tooth, to realize the complete conversion of this last premolar into a double-crested grinder.

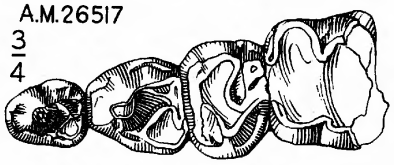

Fig. 2. *Listriodon mongoliensis*, new species. Paratype, Amer. Mus. No. 26517. Fragmentary right maxilla with P^2-M^1. Crown view. Three-fourths natural size.

The molars need little elucidation. Each tooth consists of two transverse ridges, an anterior and a posterior cingulum, and in each tooth the posterior cingulum runs up to join the point of the postero-internal cusp (presumably the metaconule). In this last particular, *Listriodon mongoliensis* is different from the other species in the genus. The last molar is characterized by the narrowness of its posterior portion, and by the lack of a true talon.

Table of Measurements

Amer. Mus. No. 26504, type.

	Length	Width	Height
P^3	21 mm.	17.5 mm.	17 mm.
P^4	19	20	15
M^1	21	21	14
M^2	25	25	15
M^3	30	27	17
Length of P^3-P^4		40 mm.	
Length of molar series		76	
Width of palate at P^3		31	
Width of palate at M^3		45	

Amer. Mus. No. 26517, paratype.

	Length	Width	Height
P^2	16 mm.	11.5 mm.	10 mm.
P^3	17	16	....
P^4	19.5	14	....
M^1	....	21.5	....
Length of premolar series		49.5 mm.	

THE PHYLOGENETIC DEVELOPMENT OF *LISTRIODON*

The genus *Listriodon* may be divided into two series, one of which is typified by strongly cross-crested, or lophodont, molars, having crowns of medium height, while the other series is characterized by its more typically suilline, bunodont, and low-crowned molars. Of course, this latter bunodont series, being more nearly like the primitive pigs, must be regarded as an unspecialized line derived from the stem forms, as opposed to the lophodont group which comprises really highly specialized suids. The relations of these two phylogenetic lines of *Listriodon* may be summarized in the following table.

	Bunodont series	Lophodont series
Lower Pliocene	*L. gigas* Pearson (Age unknown), China	*L. pentapotamiae* (Falconer) Lower Siwaliks, India *L. theobaldi* Lydekker Lower Siwaliks, India
Upper Miocene		*L. mongoliensis*, new species Tung Gur, Mongolia *L. splendens* (v. Meyer) Sarmatian, Europe
Middle Miocene	*L. guptai* Pilgrim Kamlial, India	↑
Lower Miocene	*L. affinis* Pilgrim Bugti, Baluchistan *L. latidens* (Biedermann) Burdigalian, Helvetian, Europe *L. lockharti* (Pomel) Burdigalian, Europe	
	↑	
	Ancestral form	

The close affinities between *Listriodon mongoliensis* and the typical European and Indian lophodont forms have been pointed out above. Recently a *Listriodon* has been described by Miss H. S. Pearson[1] from

[1]Pearson, H. S. 1928. 'Chinese Fossil Suidae.' Pal. Sinica, Ser. C, IV, Fas. 5, pp. 7–11, figs. 1–4.

the Kansu district of China, and it is recorded as being from beds of an unknown age. This species, *Listriodon gigas*, is a bunodont form of tremendous size, and because of its departure from the typical lophodont development in the molars, Miss Pearson was inclined to regard it as a specialization from the bunodont series, but on a line quite separate from the other members of the genus. That *Listriodon gigas* is specialized cannot be denied; its great size, for instance, must be regarded as an advanced character. But from the structure of the teeth it seems logical to regard this species as a specialization along primitive lines of development, as exemplified particularly by *Listriodon affinis* and *Listriodon latidens*. Indeed, the step from *Listriodon latidens* to *Listriodon gigas* is not very great.

Thus we see that close comparisons between *Listriodon mongoliensis* and its nearest geographic neighbor, *Listriodon gigas*, can not be drawn. Both species must be regarded as late survivors of two phylogenetic lines that persisted in eastern Asia.[1]

THE BEARING OF *LISTRIODON MONGOLIENSIS* ON THE AGE OF THE TUNG GUR BEDS

The two species of *Listriodon* most closely related to *Listriodon mongoliensis* are *Listriodon splendens* from the Sarmatian of Europe and *Listriodon pentapotamiae* from the lower Siwaliks of northern India. The European species is of Upper Miocene age (considering the Pontian as representing the lower phase of the Pliocene), while the Indian form must be considered as coming from the lower part of the Pliocene. However, we must bear in mind the fact that the entire Indian fauna represents the holdover of primitive forms into later periods, and thus we might expect a typically Miocene *Listriodon* to persist on into the Pliocene in the Siwalik series. The important fact to be remembered is that *Listriodon* is typically a Miocene, and therefore a pre-*Hipparion*, genus. On the basis of our present knowledge we recognize it persisting on into the Pliocene in India, where it is contemporaneous with *Hipparion*, and in China, where as a bunodont form it may even be of Pleistocene age.

Since the Tung Gur beds of Mongolia have yielded no *Hipparion*, and since other elements of that fauna have a distinct Miocene appearance, it would seem logical to assume that *Listriodon mongoliensis* is an Upper Miocene form, comparable in age to *Listriodon splendens* of Europe. The resemblances of *Listriodon mongoliensis* to the European and Indian

[1]According to Miss Pearson, the age of *Listriodon gigas* is unknown. From its great size and the development of its teeth, it would seem to represent a late development in the history of the genus.

lophodont species would, in fact, point to the Tung Gur as being about Sarmatian in age, which in turn would be approximately correlative with the Pawnee Creek, the Barstow, the lower Snake Creek and the Mascall of North America.

This correlation of the Tung Gur is at variance with the previously published opinions, reached by the geologists of the Central Asiatic Expedition on the basis of field evidences, in which these beds were considered as entirely of Pliocene age.[1]

It might be well to say in this connection, that the shifting of the Tung Gur formation from the Pliocene down to the Miocene is not an original idea formulated by the present author. Dr. Walter Granger, Palaeontologist of the Asiatic Expeditions, had reached the opinion some time ago, on the basis of his knowledge of the Tung Gur fossils, that the formation should properly be regarded as of Upper Miocene age. Thus the presence of *Listriodon* in the Tung Gur beds fully substantiates Doctor Granger's conclusions as to the Miocene age of the formation, thereby making it necessary for us to revise the earlier published opinions which regarded these sediments as of Pliocene affinities.

The foregoing conclusions as to the Miocene age of the Tung Gur formation have been approved by Doctor Spock and by Père Teilhard de Chardin, geologists of the Central Asiatic Expeditions for the years 1928 and 1930 respectively.

[1]Spock, L. E. 1929. 'Pliocene Beds of the Iren Gobi.' Amer. Mus. Novitates, No. 394, pp. 4–6.
Spock, L. E. 1930. 'New Mesozoic and Cenozoic Formations Encountered by the Central Asiatic Expedition in 1928.' Amer. Mus. Novitates, No. 407, pp. 7–8.

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